

Solutions

Each answer shows the steps, then the **result**.

2.1

- ethyl ethanoate

2.2

- ethanoyl chloride; ethanol

3.1 A

- $\text{HCOO}-$ is methanoate; $-\text{CH}_3$ is methyl
- methyl methanoate

3.2 B

- Phenol + benzoyl chloride
- phenyl benzoate + HCl

3.3

(a)

- $\text{CH}_3\text{COCl} + \text{CH}_3\text{OH} \rightarrow \text{CH}_3\text{COOCH}_3 + \text{HCl}$

(b)

- methyl ethanoate

3.4

- $\text{HCOOCH}_2\text{CH}_2\text{CH}_3$ drawn out; the $-\text{COO}-$ ester link circled

3.5

(a)

- $\text{CH}_3\text{COCl} + \text{CH}_3\text{CH}_2\text{CH}_2\text{OH} \rightarrow \text{CH}_3\text{COOCH}_2\text{CH}_2\text{CH}_3 + \text{HCl}$; the ester is **propyl ethanoate**; steamy white fumes of hydrogen chloride are seen

(b)

- The acyl chloride reaction goes essentially to **completion** — it is not an equilibrium — because the HCl escapes as a gas and cannot react back; esterification with the acid is reversible and stops at about 65% conversion

(c)

- The ester link is $-\text{C}(=\text{O})-\text{O}-$ drawn with the carbonyl double bond and the single bond to the second oxygen; the ester from propanoyl chloride and ethanol is **ethyl propanoate**

(d)

- **Ethanoic acid** and **propan-1-ol**; acid hydrolysis is reversible, so a large excess of water pushes the equilibrium towards the products